

!! In case of a single focus tube like RO30: APR's loaded to a RGDV with this tube connected should only be programmed on the **large** focus (use APRMAN.EXE).

- **Tube 1...3 Speed Selection** range = 3000...9000 rpm

- Exposure rotation [RPM]: >> the speed for every technique
- Fast Exposure rotation [RPM]: >> is taken from the tube data on
- Fluoroscopy rotation [RPM]: >> the installation disc

!! all stators have to be connected as an SRO tube !!

- **Tube Limits**(only [value] fields can be modified)

Tube: 1 ... 3

Max. Tube Voltage Limit [kV]: range: [20...150] kV

The value must be adapted to the max kV of the tube (see tube label). If a tube arcs during adaptation the max kV value can be reduced (or repeat the break in procedure). After adaptation the reduced value is the max value which can be selected on the control desk, even if the value can be increased thereafter in this field. The reduced value appears in 'Adapted To [kV]:'.

If a tube has been adapted with a higher kV than it should be used for (e.g. veterinary surgeons max 100kV) the limit must be programmed in this data field.

Focus: small, middle, large

The middle focus is a third physical filament in a tube (not yet available), it is **not** the VARIO focus.

Min. Tube Voltage Limit [kV]: range: [20...150] kV

All standard diagnostic tubes of the installation tube file has a default min kV of 40 kV. This value can only be modified in a range > 40kV.

Adapted To [kV]: gives the max available kV value on the control desk.

If this value must be increased, first the 'Max Tube Voltage Limit [kV]:' must be increased. Then the tube has be adapted thereafter to have the higher kV available for application.

Min. Tube Current Limit [mA]:range: [0.1 ... 2000] mA

0.1 mA is the lowest current of the Optimus. The smallest mA value one can select on the control desk for radiographical exposures is 1 mA.

Max. Tube Current Limit [mA]: range: [0.1 ... 2000] mA

The max mA value is automatically limited by the tube type **and** the generator version:

50 kW max = 650 mA 65 kW max = 900 mA 80 kW max = 1100 mA

The max mA value is initially set by the tube data set of file, it will be adapted to the individual focus limits during adaptation, max mA tables can be seen in 'Select Unit' >> 'FU_mA' >> 'Programming'.

!! If there is any application reason to modify the max mA value it is possible, but it will

!! influence all registration devices linked to this tube and might lead to problems, if

additional individual 'APR' **!!** reductions of the emission current and tube power are programmed in the
individual 'APR' **!!** Data Set's and/or in 'RGDV Data Set B'.

- **Capacitance Tube Connection** - formula = see INSTALLATION 9.3.4

- **Tube 1 ... 3 Capacitance on Tube Connection [nF]:**

range = 2.000nF - 10.000nF, a value of 5300 nF should never be increased

- **Tube Operating Modes**

- **intermediate boost:**

enable = double boost mode (default)

Active, if emission current is in a range of [Ie max] <<>> [Ie max - 20%]
Automatically **inactive**, if emission current < [Ie max - 20%].

If "single step" has been programmed at "Exposure switch type" in "Data Set A" the generator switches automatically to „disable“ = single boost mode

disable = single boost mode

(explanation see functional unit FU_mA chapter 3 FAULTFIND)

- **rotation prolongation after prep:** !! Only possible with HIGH SPEED rotor control !!

disable = tube stops immediately after exposure end or let go of the PREP hand switch
(default)

enable = once started with PREP, the tube keeps on rotating for 30 seconds if no exposure has been switched.

The tube stops

- if finally an exposure has been switched
or
- if the exposure parameters have been changed or
if another APR has been selected during the free run of the tube.

Recommended for children's hospitals and casualty rooms.

- **Disable Tube**

- If a tube has to be removed use this function. All registration devices (RGDV) linked to a deleted tube are not available anymore after generator cold- / warm start.
This function **must** be used before a single filament tube is programmed on a 'tube number' where there has been a two filament tube before (to tell FU_mA to switch off the non used filament circuit, if the single focus tube is selected).
- !! In combination with a Bucky Controller: If a tube has been disabled and this was the only one, there will be no access to the generator with the PC after generator reset. To get access remove system CAN connection EZX43-1 to the Bucky Controller before reset. It takes two minutes (timeout) after switch on or warm start.

- **Registration Devices**

- **RGDV 1 ... 8**

- **RGDV 1...8 Data Set A**

- **Room:** **Room 1...3** wiring see INSTALLATION 4.4.1

to switch over room door contacts and radiation warning lamps, not for single tube generators without HT switch

- **Tube:** **None** RGDV not available, 'None' can be used to disable a tube selection without erasing the tube data in the mA_control

Tube 1...3 a tube must be programmed to activate a RGDV

Two Room **CANGATE** Bucky systems:

- room 1 = tube 1 (no matter which 'Room' e.g. for)
- room 2 = tube 2 (door contacts is programmed)

- **Release circuit number:** **Circuit 1 ... 4**

- one out of four release circuits of a 'Release circuit adaptation unit' 1WA, 2WA (e.g. WA: 1 = EWAX1 2 = EWAX2 3 = EWAX3 4 = EWAX4)
- ignore in case of a 'Bucky controller'
- ignore, if 'none' is programmed for a 'Release circuit adaptation unit' (e.g. free cassette RGDV without cassette present interlock)
- 'RGDV' number and 'Release circuit number' do **not** have to be the same, (e.g. all 8 RGDV's can be programmed to one release circuit only)

- **Enable handswitch at release circuit:**

no = release with the desk hand switch only

yes = - release via the programmed decade only ('Release circuit number')
- **must not** be programmed in combination with Bucky Controller via CAN

- **Syncmaster present (e.g. grid contact):**

yes = has to be programmed in case of

- Release circuit adaptation units 1WA/2WA
- grid synchronization (20-21) decades X1...X4 pins 1-2
- ditto tomo sweep (exposure request of layer angle)
- cassette present interlock free cassette
- Bucky (+Tomo) via CAN Controller (grid sync via signal bus EZX23)
at **all** RGDV (FCO 00231 007)

no = in case of free cassette RGDV's via release decades
(then no link has to be inserted in any of the four release decades pin 1-2 of the adaptation units 1WA/2WA, which allows to use decades for other auxiliaries)

- **Exposure switch type:**

double step = individual PREP and EXPOSURE request with the desk hand switch or via the release decades 1WA/2WA

single step = instant EXPOSURE request with PREP activation only, released from

- the desk hand switch or
- the release decades 1WA/2WA or
- the PREP switch S2 of the 'Release circuit adaptation unit' 1WA/2WA

does **not** work without 'Release circuit adaptation unit' and with RGDV's which have not been assigned to 1WA or 2WA

!! If „intermediate boost“ mode has been „enable“d to activate double boost mode, it will automatically be off if „single step“ is programmed.

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- **Bucky format density correction (6% steps):** range = - 8 ... + 8 see [2] page
- correction during collimation, input at WAX11/12 pin 1-2, side fields active when contact closed (>24x24cm), center field only when open
- with GALILEO collimator via Bucky Controller
- **Cone density correction (6% steps):**
 - only with Release 3 generators and WB adaptor Optimus R/F
- **Dose measurement input:** none = no **AEC/AECF/TDC** function available
 - EZX21 \
 - EZX22 \
 - EZX31 >backpanel input plugs
 - EZX32 /
 - EZX41 /

AEC	=	A utomatic E xposure C ontrol	~	Amplimat falling load
AECF	=	AEC Fixed current	=	Amplimat kV-mA
TDC	=	T omo D ensity C ontrol (option)		
- **No brake after exposure end:**
 - no** = instant brake after exposure end
 - yes** = more than one exposure possible with one PREP
 - has to be 'yes' for tomo in combination with
 - a 'Release decade adaptation unit' 1WA/2WA
 - a Bucky TH with TOMO via Bucky Controller
 - Preparation must be active until the tomo stand is back to the start position (dead-man's principle)
- **Release delay (automatic techniques):**
 - enable** **Must** be set for AEC / AECF / TDC techniques to switch on kV not before the dose integrator has been reset and the offset of the chamber signal line has been measured by Dose Rate Control.
Must also be enabled if an Amplimat stand without grid sync is connected.
Automatically disabled if a non AEC technique is selected.
 - disable** instant kV with EXPOSURE command, should not be selected
- **Mounted radiographical controller:**
 - none** **!! none !! must** be programmed if any 'Release circuit adaptation unit' is programmed
 - Bucky controller 1** = Bucky TH Sensing RGDV 1...4 via system CAN EZX43-1
 - Two Room **CANGATE** Bucky systems (both at EZX43-1):
 - RGDV 1...4 - room 1 = tube 1
 - RGDV 5...8 - room 2 = tube 2
 - Bucky controller 2** = not used
 - Thoravision** = Thoravision Release 3 only
- **Release circuit adaptation unit:** (old world adaptor)

none = to be programmed in case of free cassette if no cassette present
interlock is necessary

!! none !! **must** be programmed if any 'Mounted radiographical controller' is
programmed

1WA = Bucky / Tomo

2WA = Bucky / Tomo

1WB/2WB = Scopo / Fluoro / Angio Release 3 only

If an exposure end beeper is required in the examination room (even for free cassette) the
RGDV **must** have 1WA or 2WA programmed to activate the EXON opto coupler
WA X13/14

- **Mounted tomo extension:** only, if a 'Release circuit adaptation unit' option 1WA/2WA exists

none = ok

!! none !! **must** be programmed if any 'Mounted radiographical controller' is programmed

1WA \\\ see RGDV Data Set B

2WA /// 'Used for tomo'

- **RGDV 1...8 Data Set B**

- **Used for tomo:**

no = ok

yes = - has additionally to be set if any 'Mounted tomo extension' is programmed
in 'RGDV Data Set A' (tomo time input active only in combination with
option 'Automatic input of tomo times')
- has to be programmed in connection with a Bucky Controller System with
TOMO, which gives access to the 16 tomo times in the System (tomo
time input only in combination with option 'Automatic input of tomo times')
- if 'yes' is programmed exposure time +/- corrections are not possible on the
desk

- **Disable time override:**

no = default

yes = disables exposure time +/- corrections on the desk
if a RGDV is 'Used for tomo' = yes, then 'time override' is automatically disabled

- **Tube power factor [%]:** range = 1...100% of max kW, effects all filaments of a tube

- **kV steps:**

Doseequivalent 6% kV steps <<>> 25% density steps

values: 40, 41, 42, 44, 46, 48, 50, 52, 55, 57, 60, 63, 66, 70, 73, 77,
81, 85, 90, 102, 109, 117, 125, 133, 141, 150 kV

Min and max kV values will appear on the desk as programmed in the 'Tube Limits' table.

Single = 1 kV steps in-between the programmed limits kV_min and kV_max

- **mAs steps:** 25 % (default) if film screen combinations with a sensitivity of
12 % 400 or higher are in use a 12% stepping should
6 % be programmed (for all RGDV)

- **mA steps:** 25 % (default) if film screen combinations with a sensitivity of 400 or higher are in use a 12% stepping should be programmed (for all RGDV)
12 %
6 %
- **time steps:** 25 % (default) if film screen combinations with a sensitivity of 400 or higher are in use a 12% stepping should be programmed (for all RGDV)
12 %
6 %

- **Density steps:** 25 % all RGDV should get the same step factor
12 % (default)
6 %

!! The density correction displayed on the desk only shows e.g. -1 or +2.

!! This -1 or +2 can stand for (a) step(s) of 6%, 12% or 25%.

!! All RGDV's should have the same correction factor to get the same result when used.

!! More explanation in 'Change APR Data Set'.

- **Density correction (6% steps):** range = - 8 ... + 8 (see [2] page 17)

- For individual stand or other registration device related corrections

!! No correction should be programmed before the proper density in the 'Dose Rate Control' part has been adjusted.

- **Underexposure display (non automatic techniques):**

yes The underexposure sign is blinking on the control desk, if the exposure has not been terminated by the generator (FU_mA for all **non-AEC** techniques), e.g. handswitch has been released too early or the tomo time switched by the shorter than the programmed exposure time.

no No underexposure display comes up under the following conditions:

- 'no' **must** be programmed for tomo; times switched from a tomo stand might be different to the programmed APRT time, but the tomo time of the stand must be within a tolerance of the programmed desk APRT time - 10 %

- **Tube overload protection:**

on (default), the tube overload protection is on, load reductions are active

traffic light	green	100% load	tube cold
on control	green-yellow	100% load	tube warm
desk:	yellow	80% load	medium hot
	yellow-red	64% load	tube hot
	red	0% load	>>overload >> no ready

off Desk always ready, PREP and EXPOSURE possible with 100% load, even with red light on.

Must not be programmed for Radiographic sites.

- **RGDV Interface Assignments**

!!! **Nothing** should be programmed in this part if the generator is connected to a Bucky Controller System via System CAN EZX43-1

- **Bucky/Tomo 1WA** and/or **2WA**

- **Decade Bucky 1 (X11)** e.g. EWAX11 and/or **Decade Bucky 2 (X12)** EWAX12

the
table is

- **Tomo mode switch:**

disable = (default) no remote switchover

enable = enables Bucky/Tomo remote switchover WAX11 or WAX12 pin 3-4

If 'enable' is programmed both Bucky-RGDV **and** Tomo-RGDV have to be programmed (switch related). If only one RGDV is set, the generator hangs up.

!!! Only **one** decade (X11 or X12) of each 'Release circuit adaptation unit' 1WA or 2WA can be enabled for Bucky/Tomo remote switch over, if both are programmed there **no** switch over at all.

is

- **Bucky RGDV - switch related:** (*)

none = default

RGDV 1...8

- activates the recognition of the Bucky Ready contact WAX11 or WAX12 pin 9-10 (ready = closed)
- defines the Bucky RGDV for Bucky/Tomo remote switchover, if 'Tomo mode switch' is enabled
- activates the format size correction contact (closed if > 24x24 cm) WAX11 or WAX12 pin 1-2,
!! if no automatic collimator exists, insert a link at pin 1-2 to get access to the side field selection
- if no Bucky Ready contact exists, but the format size correction has to be active: insert a link at pin 9-10

- **Bucky RGDV** (*) (*) **three** RGDV's can be programmed
- **Bucky RGDV** (*) at the same Bucky Ready contact

none = default

RGDV 1...8

- activates the recognition of the Bucky Ready contact WAX11 or WAX12 pin 9-10 (ready = closed)
- activates the format size correction contact (closed if > 24x24 cm) WAX11 or WAX12 pin 1-2,
!! if no automatic collimator exists, insert a link at pin 1-2 to get access to the side field selection
- if no Bucky Ready contact exists, but the format size correction has to be active: insert a link at pin 9-10

- **Tomo RGDV - switch related**

none = ok

RGDV 1...8

- activates option 'Automatic input of Tomo times',
!! if no Tomo Ready contact exists, but the format size correction has to be active: insert a link at pin 5-6
- activates recognition of the Tomo Ready contact EWAX11 or EWAX12 pin 5-6
!! if no Tomo Ready contact exists, but the format size correction has to be active: insert a link at pin 5-6
- defines the Tomo RGDV for Bucky/Tomo remote switchover, if 'Tomo mode switch' is enabled

- activates the format size correction contact (closed if > 24x24 cm) EWAX11 or EWAX12 pin 1-2,
!! if no automatic collimator exists, insert a link at pin 1-2 to get access to the side field selection

- Tomo Time

Tomo numbers 1...8 can be programmed in the 'APR Data Set's. Programming the times makes only sense if option 'Automatic input of tomo times' exists (programmed in the CU-function

key D38, see STAMMKARTE).

Every tomo number from 1...8 is linked to one tomo time (depending on the tomo device settings).

Every tomo time has to be programmed with a time in-between the range of 0.1 ... 6000 ms.

Tomo numbers 1...8 are directly linked to the tomo trajectories WAX22 1...8, while tomo times 1...8 are linked to the tomo time input WAX21 1...8.

*** If tomo APRT's are programmed using option 'automatic input of tomo times': Select every APRT once. For a very short time the default time of an APRT can be seen on the desk, then the tomo time contact overrides the default time. This time must be stored using the desk store function 'reset button + active APRT'. After that the tomo time is fixed. If it is not stored then the default APR time will come up again if the APRT is pushed a second time or if an APR with the same tomo time is selected. The tomo time input only reacts to a dynamic high >> low time contact change.

- If tomo is programmed in 'Data Set A + B' then it is not possible to change the exposure time on the desk. If APR with the same tomo time have to be corrected time then an APR with another time has to be selected in-between APR's with the time to have access to the changing tomo time contact.

dependent
same tomo

- It might happen that three tomo times can be seen on the desk after pushing an APRT button: The first time being displayed is the time stored in the APR. The second time might be tomo time number 1, if all time contacts of the tomo stand are open. If then the tomo time contact is closed, the status change will effect the display of the programmed tomo time.

then the
programmed

- Dose Rate Control

- AMPLIMAT

- Amplimat sensitivity:

high Sensitivity of basic interface chamber signal amplifier 4 times higher. Only possible with PCB EZ150 version 4512 108 05964 and higher, in this case jumper W4 must be in position 1 (x4).

- „High“ **must** be set in case of **TDC (Tomo Density Control)** option (only with PCB EZ150 >= 4512 108 05964 with jumper W4 in position 1 (x4)). **Exception:** If at least one of the Film Screen Combinations has a speed of < 200, 'low' must be selected.

least
selected.

- 'High' should be the recommended range if all film screen combinations of the system are >= 200 (only >= 4512 108 05964 with jumper W4 in position 1 (x4)).

low (default)

!! **Must** be low in case of PCB EZ150 versions up to and including 4512 108 05963 and versions >= 4512 108 05964 if jumper W4 is in position 3 (x1)

'Low' should be the recommended range if at least one film screen combination of the system is < 200 (only >= 4512 108 05964 with jumper W4 in position 3 (x1)).

- Chamber 1 ... 5

- Data Set 1 ... 5

- DRC Handling / Start Automatic DRC Processing

- **<OK>** Every empty line of this window has to be filled:
For PCR/FCR (computed radiography cassettes see '<CANCEL>')

FILM	default data file :	FILM.TDL	(1)
SCREEN	dto. :	SCREEN.TDL	(2)
CHAMBER	dto. :	CHAMBER.TDL	(3)
CASSETTE	dto. :	CASSETTE.TDL	(4)
SYSTEM CORRECTION	dto. :	SYSCOR.TDL	(5)
CORRECTION FACTOR		range = 0.00 ... 9.99	(6)

(1) If the film type is not in the default data list, then select one of the film files:
FILM_BL (blue), FILM_GR green), FILM_UV (ultra violet).
Select the one which matches the sensitivity factor S and RLF compensation. **S** is a
multiplication factor for the speed type of the screen:
if the screen = 400 and S_{film} = 0.5, then the total system is 200.

(2) If the screen type is not in the default data list, then another file can be selected:
LUMAT.TDL.
This file contains the luminous groups LG with different colors and different speeds.

(3) The following list gives the PEI-No. of the chambers which can be selected from the
data file CHAMBER.TDL and the typical dose request values.

		[□Gy/V]
typical Hybrid	9803 509	5.86
typical ALC	9890 000	5.24
Bucky	9803 509 10002	5.86
Childrens Bucky	9803 509 10102	5.42
Chest	9803 509 50002	5.86
Scopomat 42/52	9803 509 30202	5.68
Scopomat 63/73	9803 509 30002	5.33
Scopomat 71/74	9803 509 30102	5.16
Neuro Diagnost	9803 509 50102	8.04
Cranio Diagnost	9803 509 50602	8.04
Puck 35x35	9803 509 60002	4.37
Bucky	9890 000 01611/2	5.24
Childrens Bucky	9890 000 01621/2	4.81
Chest	9890 000 01661/2	5.24
Scopomat 42/52	9890 000 01651/2	5.07
Scopomat 63/73	9890 000 01631/2	4.81
Scopomat 71/74	9890 000 01641/2	5.16
Neuro Diagnost	9890 000 01671/2	7.17
Cranio Diagnost	9890 000 01681/2	7.17
Puck 35x35	9890 000 01691/2	3.93
Extremities	4512 102 80261/2 9803 509 50202	10.05
Extremities	4512 104 47621/2	1.14
Junior-	/ 4512 103 06661/2 9803 509 51202	3.32
Diagnost	\ 4512 104 47621/2	1.14
Mammo-	/ 4512 127 98802	3.32
Diagnost	\ 4512 127 98803	1.40
Mammo-	/ 4512 104 18811/2 9803 509 70002	3.32
UC/BC	\ 4512 104 47621/2	1.40
X-CONSTANT DV=1VOLT		

(4) normal cassette (default) Al (factor 1.0)
carbon fiber cassette (factor 1.12)
1/2 screen normal cassetteAl (factor 0.5)
1/2 screen carbon fibre cassette (factor 0.56)
factors can not be changed

(5) no correction (ISO9236-1) = linear kV behaviour

low-kV-correction = correction factors kV dependent:
40 50 60 70 80 90 100 120 140 150 kV

0.7 0.78 0.89 1.0 0.99 0.95 0.92 0.94 0.98 1.0

- (6) The default value is 1, representing a density of 1. If no PC-hard key exists, this field is the only chance to modify the density of the programmed FSC. If the value has to be changed to the desired density after the dose and density measurement, the whole window has to be programmed again, unfortunately. If the PC-hard key exists, use the function 'Start Automatic DRC Processing' -> '<CANCEL>' and keep the correction value on 1, if not, use the following formula:

$$\frac{\text{desired density}}{\text{measured density}} = \text{new [CORRECTION FACTOR]}$$

The name of the FSC is the abbreviation of the resulting speed and the color of the film screen combination. There might be names like 'B400' for a blue 400 combination or 'G200' for a green 200 combination.

The name can be changed (only with the PC-hard key), see 'Start Automatic DRC Processing = <CANCEL>'. The name **must** be changed if different film screen systems with the same resulting name exist. A change from the first G200 to second one can not be recognized on the desk.

Combinations of systems with different colors can not be programmed (even if they exist).

If a film screen combination is used with different chambers and a data set is programmed once, then it can easily be copied to other chambers/data sets with the PC-hard key):

Use the '<CANCEL>' function, the data screen will be displayed. With the 'Save' function <F3> the data screen can be loaded to the disc/hard disc with any

name (e.g. Ch1D1). If a data set is opened on another chamber the stored file can be loaded with <F4> + file name to the open data set. Transmit the dataset with <F2> thereafter.

- **<CANCEL>** or: use <ESC>

Some values in the data sets of the chambers can be changed, others should not be changed (kV dependent characteristics).

If PCR/FCR cassettes are used, type the desired sensitivity (speed) in the name field. Select the 'Dose Request Chamber [$\square$ Gy/V]:' value from the list page 11 type it in. The value 'Dose of FSC [$\square$ Gy]:' must be calculated: 1000 / [speed

(1000/200_speed_system = 5).

There should be no correction values in the **kV70-Char.** correction (except 1.00) and **RLF** (except 1.000) fields.

Abbreviation:

The name of the film screen combination can be changed into every 6 digit string. An FSC can be erased by filling the name field with blanks, but: !! There should **never** be a gap in-between the FSC data sets of a chamber. If only one FSC is used, it **must** be on data set 1, the second **must** be on 2 etc.

If e.g. 4 data sets are active and the 1st will be 'blanked', all FSC's are no more accessible and AEC is no more available for this RGDV.

If any FSC will be removed from the last position all APR linked to this FSC have to be changed to any other still existing FSC, otherwise no FSC will be displayed on the desk. When these APR are changed to another FSC the background mAs values have to be adapted to the FSC sensitivity.

Dose Request Chamber [$\square$ Gy/V]: range: 0.50...32 $\square$ Gy/V

Dose of FSC [$\square$ Gy]: range: 0.45...100 $\square$ Gy

The initial value 'Dose of FSC [$\square$ Gy]:' of the automatic DRC processing has been calculated for a density of 1. It can be changed into any other desired value, e.g.

1.5.

$$\frac{\text{desired density}}{\text{measured density}} * \text{default [Dose of FSC]} = \text{new [Dose of FSC]}$$

If an APR is selected with AEC technique the exposure data on the desk will display the abbreviation of the FSC and a 'zero' with a triangle for the density. This 'zero' is the basic value for the desired density. It does not change even if the value for the [Dose of FSC] will be modified.

- **Fault Exposure Detection**

- **AEC**

off = (default) no 4% dose supervision at 10% of the backup exposure time, automatically off after APR overriding

on = At 10 % of the backup exposure time (APR mAs value) DRC detects if at least 4% of the expected dose have been measured. If not, the exposure will be switched off by CU.

- **TDC**

off = (default) no 4% dose supervision at 10% of the backup exposure time, automatically off after APR overriding

on = At 10 % of the backup exposure time (APR mAs value, tomo time > 1000ms ,not before 250ms) DRC detects if at least 4% of the expected dose have been measured. If not, the exposure will be switched off by CU.

- **Application Limits**

- **X-Mode Limits**

Limits can be modified within the range of the value fields. Values should not increase the local limits.

The 'Max. Time Limit' of 60000ms is not available with Release 2.3, only 16000 ms.

- **Thoravision Limits**

Thoravision not available with Release 2.

- **Human Interface**

- **Select Language**

English
German
French
Spanish

Messages like 'door open', 'menu' etc. and language characters (letter list see INSTALLATION 12..1.) are related to the programmed language.

- **APR Data Set**

- **Select APR Data Set**

Select any APR on the desk, the name will be highlighted. After <Return> on the PC the APR No. will be displayed on the PC screen. This number can be used for 'Inquire APR Assignments'.

If this 'Select APR Data Set' window is transmitted with <F2>, it allows to look into the complete APR data set if the following 'Change APR Data Set' command will be used.

(It is **not** possible with the default 'Test APR'.)

Any APR No. in-between 1 and 1024 can be typed in, no matter if this APR No. is assigned to any RGDV. When using 'Change APR Data Set' thereafter one can see the default APR

data

set or a modified APR.

- **Change APR Data Set**

This function opens the window to change the complete APR data set. Data marked with a **[1]** can only be changed in this window via PC.

All other non marked data can be changed on the desk and saved via the button combination 'Reset (hold it) + the highlighted APR'.

If this 'Change APR Data Set' function is used with e.g. APR No. 135, it will always change back to APR No. 1 after a generator cold/warm reset. In this case the 'Select APR Data Set' command has to be used before to get the actual highlighted APR data set.

(Change APR is **not** possible with the default Test APR.)

- **[1] APR number:** is just a (random given) pointer

This number can be used to copy a data set into another data set. In that case the destination APR number ('Select APR Data Set') has to be filled in the 'APR number' field and transmit <F2>. The 'source' data set does not change.

To move an APR data set copy a data set to the desired destination and delete the source APR data set afterwards with 'APR deassign'.

There has to be an active destination APR. Error 00BR will come up if a data set is loaded/copied to an APR which is not assigned to any RGDV.

If APR backups are reloaded the APR numbers of the backup file will be the same after reloading except if an individual RGDV backup file will be loaded to any other RGDV. If 'APR number' already exists the one being loaded will get any other. Important if

an
generator is
the handle.

connected to a Bucky TH with sensing, where APR numbers are programmed in

- **[1] APR name:** 16 characters are possible

This field should NEVER be empty ! An empty field will lead to a total hang-up of the CU in combination with a Bucky Controller. The only solution to come out of this hang-up is to the CMOS and reload the 'CU Complete' backup or start programming from scratch.

erase

If special letters are needed (language dependent) see INSTALLATION 12.1 letter codes.

If APR data are changed on the desk the two last digits of a 16 character string will be used to indicate ' *_ ' = 'overriding'.

Example: **[infant 10-15 yrs]** will change into
[infant 10-15 y *_] after overriding.

- **Focus:**
 - small** = small filament of the tube
 - middle** = (in case of a 3 focal spot tube)
 - large** = large filament of the tube
 - vario** = is a virtual focal spot, its size (tube type dependent) in-between large and small focus can be selected via the 'Vario focus ratio', only with **SRO25/50, SRO33/100, SRO09/50, RO17/50**

- **[1] Vario focus ratio:** range: 20%, 35%, 50% (default) , 65%, 80% of small focus

Sets the ratio of small and large focus, for tubes with superimposed focal spots,. The ratio should be typed in the 'APR name' field at the end of the line. Example: 'Thorax_ap____50%'

- **([1]) Dose measurement field (left):** on/off
Dose measurement field (middle): on/off

Dose measurement field (right): on/off

At least one of the measuring fields must be 'on' in an APR to have access to AEC technique even if the 'Preferred technique' is set to 'No AEC technique'; a chamber must be programmed in 'RGDV Data Set A' + 'Dose measurement input'.

The default APR data set [### APR name ###] has all 3 fields 'on'.

Some customers like to have 'technique APR's' only. In that case switch 'off' all fields so that there is no way to change to AEC technique if AEC is possible in the same RGDV/menu/page.

- **[1] Preferred technique:**

Non automatic

If this APR will be selected, one of the three 'No AEC technique's will be displayed on the major exposure data display.

With the 'mA-s' technique button on the desk one can switch over from kV-mA-ms (LED on) to either kV-mAs or kV-mAs-ms technique (LED off), depending on what has been programmed.

If a 'Dose measurement input' is programmed in 'RGDV Data Set A' and at least one measurement field is 'on' this APR can be switched over to AEC technique, which will cause the overriding sign ' * ' coming up.

dose

Automatic

AEC/TDC technique will appear when this APR is selected (AEC technique button LED and 1...3 measuring field LED's on).

*** All predefined APR data sets from the disc are programmed for a 400 speed system. If then e.g. a 200 speed system exists, all non AEC technique values (e.g. mAs) have to be doubled, if an 800 speed system exists, the mAs values must be divided by 2.

- **[1] AEC technique:**

AEC falling load kV

the mA start value of the falling load exposure will appear in the „Exposure data I [mA]“ field

AEC fixed current kV-mA

the fixed mA value or the desired mAs value in combination with the desired exposure (examination) time has to be programmed in the „Exposure data I [mA]“ field

Select **kV-mA-ms (RUIT)** or **kV-mAs-ms (RUQT)** in „No AEC technique“

TDC (Tomo Density Control) (option, see STAMMKARTE)

the TDC start mA value or the desired mAs value in combination with the tomo sweep time has to be programmed in the „Exposure data I [mA]“ field

Select **kV-mA-ms (RUIT)** or **kV-mAs-ms (RUQT)** in „No AEC technique“

- **[1] No AEC technique:** = all non Amplimat techniques

Two of the three „No AEC technique“s are available in every APR.

If either kV-mAs or kV-mAs-ms technique is selected one can switch over to kV-mA-ms technique pushing the mA-s button on the desk.

If kV-mA-ms technique is programmed in the APR and it will be 'deselected' by pushing the mA-s button (LED off) it only changes to kV-mAs technique.

The preferred „No AEC technique“ after AEC-deselect can be changed on the control desk with the overriding-save function.

!!! If kV-mAs-ms technique is selected as preferred it will change to kV-mAs if the APR data set has been modified on the control desk and has been saved with kV-mA-technique !!!

ms

kV-mA-ms technique (RUIT) (Radiographic kV-mA-s), choice of kV, mA and ms parameters

To be selected in case of „AEC fixed current kV-mA“ and „TDC (Tomo Density Control)“ techniques (or use 'kV-mAs-ms (RUQT)').

kV-mAs technique (RUQ) (Radiographic kV-mAs), choice of kV and mAs parameters

kV-mAs-ms technique (RUQT) (Radiographic kV-mAs-s), choice of kV, mAs and ms parameters

To be selected in case of „AEC fixed current kV-mA“ and „TDC (Tomo Density Control)“ techniques (or use 'kV-mA-ms (RUIT)').

selected

This technique is very helpful for tomography. Exposure time and mAs can be individually, depending on the tomo sweep and the organ & patients size. Time +/- selection is not possible if RGDV is programmed 'Used for tomo = yes' in 'Data Set B'. Then time selection is via tomo time input (decades or Bucky

controller).

the
called

Depending on one of these 3 techniques only the relevant parameters in the following 'Exposure data nn' have to be modified. All other parameters will be calculated by generator itself after transmission with <F2>. If the same APR data set will be again, the changes in the slave values can be seen.

(e.g.
to be

*** All predefined APR data sets from the disc are programmed for a 400 speed system. If then e.g. a 200 speed system exists, all non AEC technique values mAs) have to be doubled, if an 800 speed system exists, mAs values have divided by 2.

- **[1] Tube current max. factor [%]:** range = 1...100% (default 100 %)

where
result of the
also

The max emission current can be modified within the above range. The reduced current (see 'Exposure data I [mA]') can be the start mA value of the AEC exposure. It will be a constant value during the exposure until it comes to a point the mA have to be reduced (falling load) within 4000ms. The mA value as the % reduction is only valid for one kV value. With the change of kV the mA value changes.

The mA value can be seen if the APR data set screen has been transmit with <F2> once. Call the same data set again and the calculated mA value appears. Another way to see the mA is on the desk: Push the APR button, switch off AEC. The background technique will come up. In case of kV-mAs or kV-mAs-s push the mA-s button to switch over to kV-mA-ms technique. The displayed mA is the value which is the

one step below the max value in the row of the programmed mA steps (see 'RGDV Data Set B'). Now push the mA + button to get the max mA value. This is the same as in the data set displayed on the PC screen.

will

If an APR with small focus will be changed by pushing the large focus button the +mA button has to be pushed until the max value is reached. A change from large to small immediately display the max mA.

with

The calculated mA value should be typed in the APR label, so that the customer gets a chance of minimum selection criteria. One should tell him that the mA value changes the kV +/- and focus selection.

!! The modification of the max factor will lead error 00L\$ if the resulting mAs value is below 0.5 mAs.

- **[1] PSC U thin (dose equivalent steps):** range = 0...-5 dose equivalent kV steps

small 'patients size correction' kV

- **[1] PSC U thick (dose equivalent steps):** range = 0...+5 dose equivalent kV steps
large 'patients size correction' kV
- 17 - **[1] PSC Q thin (6% steps):** range = 0...-10 mAs steps see **[2]** page
small 'patients size correction' mAs
- **[1] PSC Q thick (6% steps):** range = 0...+10 mAs steps see **[2]**page 17
large 'patients size correction' mAs
- 17 - **[1] PSC density thin (6% steps):** range = 0...-10 dens. steps see **[2]** page
small 'patients size correction' density correction
- 17 - **[1] PSC density thick (6% steps):** range = 0...+10 dens.steps see **[2]** page
large 'patients size correction' density correction
- [2]** Depending on the step rate of **mAs-** and **density-correction** programmed in 'RGDV Data Set B' these correction values must have an even factor with the basic step rate:
To get a correction of one mAs-correction step 25 % (Data Set B) four 6%-steps have to be programmed here.
To get a +1 density step displayed two 6%-steps have to be programmed here if 12%-steps are programmed in 'Data Set B'.
- **Exposure data U [kV]:** range = 40...150 kV or what has been programmed at 'Tube limits'
If full range is not available, check „Tube limit“ settings.
- **Exposure data I [mA]:** range = 0.1...2000 mA
Depending on the tube type, focal spot, selected technique and all reduction factors; this value can be a master or slave value.
The result of a [mA]*[ms] multiplication must always be ≥ 0.5 mAs.
If total mA range is not available, check „Tube limit“ settings.
- **Exposure data Q [mAs]:** range = 0.5...1000 mAs
Depending on the tube type, focal spot, selected technique and all reduction factors; this value can be a master or slave value.
If total range is not available, check „Tube limit“ settings.
- **Exposure data t [ms]:** range = 1...16000 ms
Depending on the tube type, focal spot, selected technique and all reduction factors; this value can be a master or slave value.
The result of a [mA]*[ms] multiplication must always be ≥ 0.5 mAs
If total range is not available, check „Tube limit“ settings.
- **Exposure data density (6% steps):** range = -16...+16
Depending on which step rate has been programmed under 'RGDV Data Set B', explanation see 'PSC density thick', see **[2]** page 17.

*** If APR with AEC are linked to a certain Film-Screen-Combination the basic density value of this FSC appears as a 'zero', because this 'zero' (X) - value based on a density of 1. Even if the density has been modified to e.g. 1.5 the 'zero' (X) remains on the major exposure data display on the desk.
There are organs where the 'zero' density is the right one, but also some where an X-2 or an X+3 correction must be programmed. SCP and Medio CP are based on 12% steps for every +/- 1 correction, so should the Optimus be programmed in 'Data Set B'. For every +/- 1 step based on 12% +/- steps have to be set here.

- **Film screen comb.:** Gives the selection of all available FSC names programmed under the chamber linked to the RGDV where this APR is assigned

Default = def 1, if no FSC programmed yet.
If 'Predefined Assignment' APR's or old (backup) APR data sets are loaded to the RGDV's, the FSC of 'Data Set 1 of Chamber (1..5)' will initially be linked all APR's.

If another FSC shall be used the change can be done here or via the overriding/save function on the desk.

*** All predefined APR data sets from the disc are programmed for a 400 speed system. If then a 200 speed system exists, all non AEC technique values (e.g. mAs) have to be doubled, if a 800 speed system exists, the mAs values must be divided by 2.

- **[1] Tomo Number:** 1...8 (Release circuit adaptation unit 1WA or 2WA)
1...16 (Bucky Controller 1 via CAN)
default = 1

Only relevant if option 'Automatic Input of Tomo Times' is programmed in function key D38 on CU (see STAMMKARTE on kV_power cover plate or 'Options' under 'Faultfind').

To activate the function the tomo mode link WAX11 or WAX12 pin 3-4 must be closed.

Activation under 'RGDV Data Set A + B', 'RGDV Interface Assignments' and 'Tomo Time' for the programmed 'Release circuit adaptation unit'. Then 8 tomo numbers are available.

In case of Bucky Controller System with TOMO 16 tomo times are available, but for Tomo Nr. 10 e.g. of the system Tomo number 11 has to set in the APR data set.

If no tomo unit is present: ignore.

Tomo time input via decades (1WA or 2WA X22/21):

If tomo APRT's are programmed using option 'automatic input of tomo times':

Select every APRT once. For a very short time the default time of an APRT can be seen on the desk, then the tomo time contact overrides the default time. This time must be stored using the desk store function 'reset button (hold it) + highlighted APRT'. After that the tomo time is fixed also in the APRT. If it is stored the default APR time will come up again if the APRT is pushed a time. The same happens if an APR with the same tomo number is tomo time input only reacts to a dynamic high-low status change of contact. The times can only be changed in the data set via PC or if will be selected to switch back to the same tomo time.

It might happen that tomo time 1 comes up on the desk for a very short time. This is dependent on the delay times in-between the switch off of the old tomo time contact and the switch on moment of the selected tomo time contact.

Tomo via Bucky-controller:

so, If the default programmed tomo times in the APR data set are different to the tomo times send by the Bucky system the default APR time appears for a very short moment, then the time will be overridden by the controller message. If use the store function of the desk to fix the proper tomo time in the APR data set.

- [1] **Spectral Filter:**

gives a selection of the three filter types of the GALILEO collimator via bucky controller

no filter
2 mm AL
0.1 mm CU + 1 mm Al
0.2 mm CU + 1 mm Al

- **Inquire APR Assignments**

The OPTIMUS has 1024 APR. Once activated, every APR data set gets an APR Number. These numbers are given without any special system (it's more or less random). If a certain APR number is known, typed in and transmit with <F2>, the window coming up gives the APR name, the RGDV and menu where it is assigned to (blank in case of none), the page, line and column of its position.
if an APR number is typed in which has not yet been 'opened' the location fields (RGDV, menu, submenu, page etc.) are empty, the name might be [### APR name ###] or any old name of an APR which has been deassigned.
To get the APR No., just select any APR button on the desk. Then use 'Select APR Data Set'.
(It is not possible with the default 'Test APR'.)

- **RGDV related Assignments**

- **RGDV 1 ... 8**

- **Predefined Assignments**

The Load Data from Disk window offers all predefined APR data sets of the installation disc or other predefined files (or use APR manager APRMAN.EXE to create customized data files, the last version is always available on BBS).

The name of these files is A*****.TDL.

A***M****.TDL files are for tubes with one filament only (_RO30), A****V***.TDL files for generators with VARIO focus option, A****V9**.TDL with VARIO focus option especially SRO09/51.

for

The files may contain data sets in a window Available Examination Unit Type :

<u>BUCKY GR</u>	Bucky table APR under a group (menu) layer
<u>BUCKY PA</u>	Bucky table APR paging (scroll through the APR pages)
<u>WALLSTD GR</u>	Bucky wall stand group
<u>WALLSTD PA</u>	Bucky wall stand paging
<u>FREE GR</u>	Free technique (non AEC) group
<u>FREE PA</u>	Free technique (non AEC) paging
<u>TOMO LT/HDH</u>	Tomography group
<u>TOMO LIN/PA</u>	Tomography paging

installation before moment are After the transmission of the APR from the PC to the generator 'waiting' will appear on the PC screen. Now the generator is calculating the source data from PC to the individual parameters (generator power, tube type etc.). The generator **must not** be reset 'waiting' disappears, otherwise APR which have not yet been calculated at that lost.

RGDV related backup files (APR_BAKx.TDL, x=1...8) can also be loaded to the generator with the same 'Predefined Assignment' function.

It is possible to load all RGDV with predefined APR data sets and make one generator reset at the end of all loading procedures. After every reset all newly loaded APR and menus appear on the desk.

It is not possible to load a second data set on top of an existing data set. In that case the old RGDV menu/APR structure has to be erased before with 'Delete Menu'.

With the XRGSCOPE - File option one can use the editor to modify the predefined APR data sets or backup data sets (e.g. to change all APR to large filament in case of a single filament tube).

This is easier and faster as if every APR will be selected on the desk and the 'Select APR' followed by the 'Change APR' function is used. One advantage is that this can be done on the PC offline the generator.

The handling is very easy, is almost similar to the 'Change APR' screen online with the generator. After modification the data set has to be saved with <F3>, the filename could be the same or any other.

Only data sets with up to 50 APR can be modified. There is no way to change the amount of APR.

It is easier with the APR-manager APRMAN.EXE, which runs under Windows

IMPORTANT REMARK: SINCE THE INTRODUCTION OF AGENT THE FOLLOWING APR FUNCTIONS ARE ONLY AVAILABLE VIA XRGSCOPE: AGENT DOES NOT SUPPORT THE FUNCTIONS ANYMORE:

- **Manual Assignment**
- **APR Assignment**
- **Select Menu**

The menu name field is as long as the longest menu name. If the field is only two digits long and only one field is displayed after <RETURN> there is no menu.

If no menu structure exists, proceed directly to 'Assign APR'.

If APR's shall be in a menu structure, assign this(these) before in 'Menu Assignment'.

If an APR shall be added to a menu this has to be selected first. Transmit this window with <F2> after selection.

- **Assign APR**

The window will offer either '### APR name ###', which is the default data set or, if there has already been another APR structure, some of the deassigned APR's 'APR Deassign'.

It indicates (automatically) the position where it will be loaded to: page, line and column.

The order of APR positioning on a page is always like this:

column 1 line 1,2,3,4

column 2 line 1,2,3,(**)

(**)- if APR's are programmed under a menu, the next APR will be assigned to the next page column 1 line 1, this position column 2 line 4 indicates 'menu' to come back to the menu screen

- if no menu structure exists column 2 line 4 will be the next APR position, followed by the next page column 1 line 1 etc.

Any position can be typed in. If the position is already occupied, an error will come up.

If only one APR on position column 2 line 3 exists under a menu structure, the next APR position will be on the next page, even if all other positions on this page are free.
The automatically given positions can be changed to fill up empty positions.
Do not assign an APR on position column 2 line 4 under a menu structure, it will be transmitted to nowhere.

- **APR Deassign**

- **Select Menu**

The menu name field is as long as the longest menu name. If the field is only two digits long and only one field is displayed after <RETURN> there is no menu.
If an APR shall be removed from a menu structure this menu has to be selected first.
If no menu structure exists, proceed directly to 'Deassign APR'.

- **Deassign APR**

'Deassign APR' gives a selection of the APR programmed under a menu or a paging structure (it does not matter if there are empty fields in-between the APR).
Deassigned APR are not totally lost. There might be access to deassigned APR under 'Assign APR' if the amount of APR is ≥ 500 .
Deassigned APR can still be seen on the desk if no generator warm reset was made after deassignment, but they are no longer accessible.

- **Menu Assignment**

- **Select Menu**

There are structures possible with a menu layer first and a second submenu layer.
Creating submenu structures: first assign the main menus under 'Assign Menu'. Then 'Select Menu' and program the submenu names under the main menu with 'Assign Menu'.

!!! At least one APR has to be programmed under one of the lowest menu or submenu layer to have the structure fixed.

If once an APR is programmed under a menu there is no further submenu layer possible.

The 'Select Menu' name field is as long as the longest available menu name. If no menu is accessible there will be the message 'The requested table is empty'.

- **Assign Menu**

This function can be used to assign menus to an empty RGDV. It can also be used to add a menu to an existing menu structure (in the same layer) or to create / add submenus.

Menus can not be assigned if a paging structure with APR only is programmed.

Submenus can not be assigned if APR's already exist under a menu. In this case no menus are offered under 'Select Menu'.

- **Delete Menu**

This function allows to delete the selected menu including the whole structure under it.
This can be an APR layer only or submenus including all APR's.

The function offers all menus under a RGDV including an empty field on top. If this empty field will be transmitted with <F2> the complete menu/submenu/APR structure will be erased. After generator reset 'test APR' will appear on the desk. This should be used to clear a RGDV before new predefined APR data sets are the 'Accept' >> 'Restore' (to reload backup files) function is used.

function
loaded or

!!! If any button on the control desk is pushed after transmit <F2> of this function, the desk hangs up and an error message 00E0 comes up.

Solutions: - warm start the generator afterwards (desk displays: Test APR)

- load APR to the RGDV immediately after 'Delete Menu' and warm start

- **Move Menu**

Menus or submenus can be moved within its layer to a free position (column and line), which has to be defined before. Moving menus to other RGDV's is not possible.

- **Rename Menu**

The menu name can be changed into everything desired (characters see INSTALLATION chapter 12.1).

- **External APR Assignments**

- **Device Interface 1** only possible, if 'Release circuit adaptation unit' is programmed as 1WA unit (jumpers W1/W2/W3 open at WA backpanel)

<u>RGDV key 1:</u>	position 1	1 2
<u>RGDV key 2:</u>	position 2	3 4
<u>APR key 1...6</u> <u>(0 no APR):</u>	positions 3..8	5 6 7 8

It can be programmed with two of the activated RGDV's. Six APR's of every activated RGDV can be assigned to the six buttons 3...8. To get the „APR key“ numbers use 'Select APR'.

The APR numbers must be entered in the RGDV # where they are assigned to. The two RGDV keys appear in all RGDV's.

If an assigned RGDV and/or an assigned APR is selected on the control desk, the RGDV/APR button will light up at the external APR module.

- **Device Interface 2** only possible, if 'Release circuit adaptation unit' is programmed as 2WA unit (jumper W1 closed, W2/W3 open at WA backpanel)

APR key 1...8 **(0 no APR):** positions 1..8 = keys 1..8

8 APR of each activated RGDV can be assigned to the 8 APR keys (>> max 64 !!). It is recommended to use one RGDV only.

If an assigned APR is selected on the control desk, the APR button will light up in the external APR module.

- **APR modifiable by User**

Yes = all data which can be overridden on the desk can be stored with the save function 'Reset + APR button'

No = the save function after overriding is disabled, should be programmed if the MENU/APR structure is stable after a certain time or if there are 'gamblers' site

on

Optimus (XRG90) >> Adjust

- Adjust

- Tube Adaptation

The tube adaptation includes

- 1) the measurement the mA offset value of the kV measuring circuit
 - 2) the measurement of the individual standby filament current
 - 3) the kV dependent filament/emission current behaviour
 - 4) the positive and negative boost adaptation
- in one procedure.

The generator should be in a ready condition. Select a RGDV with free cassette programming (no grid sync contact).

Press <RETURN>

An opening screen asks to wait 20 seconds after the screen coming up thereafter has been <TRANSMIT> with <F2>.

Tube: **1st Tube**
 2nd Tube
 3rd Tube

Focus: **small**
 medium a tube with a (third) medium filament does not exist yet, it is **not** Variofocus
 large

After <TRANSMIT> of the screen the green ready disappears from the desk for 20 seconds. The „Test“ sign on the right side of the major exposure parameter display will change to „Adap“, normal exposure parameters like film-screen-combinations will disappear during a readaptation procedure to display „Adap“.

The green ready returns, the first data set **40kV 0.00mAs** comes up, which is the exposure data set to measure the mA measuring circuit offset.

After about 30 sec **40kV 1.5mAs** will be switched for 6 seconds to measure the individual standby filament current.

After 20..30 second a row of exposure with different kV stages are switched (about 120 / filament). 4 min after start of adaptation the boost adaptation takes place. One exposure is for the positive boost (to measure the boost up time), the last exposure of the whole procedure is the negative boost (to measure the blank time). The tube will brake the last time, a beep on the PC appears and a window on the screen will ask you to reset the generator.

During the adaptation it might happen, that the procedure stops for a while. The red light of the temperature traffic light lights up, 00BU will appear in the error log index. If the TTS (Tube Temperature Supervision) sees a temperature in a critical range it will stop adap for a while to keep adap always in a 100% load range.

After adaptation all techniques are available and the „Test“ sign disappears (for the adapted filament).

- **CAN Auto Configuration**

Start function: Update Generator Config:

<OK> gives the command for CU to scan on the internal generator CAN bus and update the CAN member list.

Minimum configuration of an OPTIMUS:

FU_mA (EZ119), **FU_kV** (EZ130), **FU_CU** (EZ139), **FU_CIE** (EZ150).

If now an optional Functional Unit shall be added (e.g. FU_ADAP = 1WA = PCB EWA102) this command must be given to assign this board to the CU CAN list.

If a generator is getting a new (empty) PCB CU or the CMOS has to be erased for any reason, this function must not be carried out. The CAN member list will be created during the very first switch on.

<CANCEL> or **<ESC>** nothing changes

- **Area Exposure Product** If the area dose shall be displayed on the control desk the option must exist (see STAMMKARTE) in the function key EZ139 D39 (see „Faultfind - GALILEO Power ON Results - Options). The option requires the collimator via Bucky controller.

- **Specific Yield of Tubes**

- **Specific Yield of Tube 1...3**

Procedure to measure and modify the specific tube yield see INSTALLATION 16. The default yield data table is on the installation disc: REF_YIEL.TDL.

- **Add Filter Correction Table** to adjust deviations of the default filter correction tables of the homogenous GALILEO collimator filters

- **2 mm AL** The default data table is on the installation disc: REF_2AL.TDL.

- **1 mm AL + 0.1 mm CU** The default data table is on the installation disc: REF_01CU.TDL.

- **1 mm AL + 0.2 mm CU** The default data table is on the installation disc: REF_02CU.TDL.

- **Wedge Filter Correction Tables** to adjust deviations of the default filter correction tables of the GALILEO wedge filters
Available with Release 3.

- **Wedge 1** The default data table is on the installation disc: REF_WED1.TDL.

- **Wedge 2** The default data table is on the installation disc: REF_WED2.TDL.

- **Finger Wedge** The default data table is on the installation disc: REF_FING.TDL.

- **Boost Adaptation** Boost adap is part of the automatic „Tube adaptation“ procedure. If it might be necessary (no reason known yet) this function can be used, normally:

ignore.

!!! Date and Time must be set or checked after restore is finished. **!!!**

- **Inspect**

- **Exposure Counter**

- tube** **number of exposures**

- 1** >> total amount
 - 2** >> of small and large
 - 3** >> focus exposures

- **Type of Tube 1...3**

- Tube name + housing type** as programmed from the tube data file.

- No name in: no tube programmed.

Optimus (XRG90) >> Faultfind

- Power ON Results

- Options

This screen displays all options programmed in the function key EZ139 D38 (compare with STAMMKARTE on the cover of the frontal kV_power unit).

- Internal CAN Configuration

This screen displays the actual members on the internal generator CAN.

Basic units: **FU_mA** EZ119 **FU_kV** EZ130 **FU_CU** EZ139 **FU_CIE** EZ150

Optional units: **FU_HI** C300 **FU_I/O** 1/2WA102 **FU_ROCO_HS** Y100

FF = optional unit not present

F0 = optional unit on the member list, but no response

2 = unit present and ok

01 = no response from basic unit

- SW/HW - Versions

This screen displays the actual firmware versions **Release**, Version (don't care) and **Level**.
For the PCB Central Unit it also displays the hardware version.

- Logging Table

- Error Log

- Error Log Index gives an overview of the events logged in the FU_CU CMOS.

Index Max 38 events can be logged. The last event is always in the highest index number. If all 38 lines are filled, line 38 will log the last event and the oldest event (line 1) disappears.

Code Displays the 4 digit code. The first two digits represent the error source (**F**unctional **U**nit number, HEX format), the last two digits the event mailed by the unit.

Date of Error Event entries should have a regular date and time format. If the date and time column also contains any letters,
the clock has not been set

- after the very first switch on
- after PCB CU exchange
- after NV-RAM = CMOS erase of CU
- after „Restore“ of „CU Complete“

Error Explanation gives a brief explanation of an event.

- Select Error Detail Index []

After looking through the „Error Log Index“ one can enter the index number of an event to get the details. The last index number is automatically in the entry field.

- Error Log Detail

Not every functional unit supports detailed event logs. If event source is not CU, kV or mA, **FU not supported** will be displayed.

- Error Detail of CU

- **Error Info** to be continued
- **Program Trace**

- **Error Detail of kV**

- **Error Info** to be continued
- **Program Trace**
- **HW Set Value** some details page xxx
- **Read HW Values**
- **Error Specific Info**

- **Error Detail of mA**

- **Error Info** to be continued
- **Actual Status**
- **Status Trace** some details page xxx
- **HW Set Values**
- **Read HW Values**
- **Error Specific Info**

- **Error Log Clear**

Start function: Clear Error Log If send with <OK> all entries are erased.

- **X-Ray Log**

- **Tube Temperature Supervision Logging**

- **Tube Temperature Supervision Temperature Log**

Three tube temperatures are supervised by the TTS calculation model. Every second the temperatures are revised and updated in this table. Overload flags (see part: 23456) are and housing type dependent. Tables disappear with switch off, but actual temperatures be calculated and updated during switch on or warm start.
After a long switch off period (over night) all temperatures should be at 20°C (basic value).

tube
will

time time table in seconds
tube tube number (1...3)
T(2) spot temperature
T(3) track temperature
T(4) anode disk temperature
T(5) rotor temperature
T(6) oil temperature

part: 23456 0 0 1 0 0 0 0 0

traffic light on =1 || || ||
 yellow red ||
overload at temperature = 1 ----- T(2) T(3) T(4) T(5) T(6)
standby = 1, EXON = 0 ----- 1/0

a 1 at T(2)...(6) indicates, which limit has been increased to turn on yellow or red

- **Tube Temperature Supervision Load Log**

This Tube Load Table displays all loads to the tube and housing. The table disappears after switch off or warm start.

time in seconds
tube disk energy [Ws] parameters
peak load max peak load in [W]

rotor energy	acceleration and brake energy in one package in [Ws]
focus	filament used for the exposure

- **Tube Temperature Supervision Error Log**

to be continued

- **Dose Rate Control Logging**

- **Read Actual Status**

to be continued

- **None Automatic Technique Calculation**

to be continued

- **AEC**

- **AEC Calculation**

to be continued

- **AEC Trace**

to be continued

- **TDC**

- **TDC Calculation**

to be continued

- **TDC Trace**

to be continued

- **CU Trace**

to be continued

- Select Unit

- FU - mA

- Program

- Read Focus Limits

Window asks for Focus number. Type in focus number FU-mA (1...6):

<u>focus number FU-mA</u>	<u>phys fil circuit FU-mA</u>	<u>focus number CU (0..8 = max 9)</u>
1 large focus tube 1	filament circuit 2	focus number 2
2 small focus tube 1	filament circuit 1	focus number 0
3 large focus tube 2	filament circuit 2	focus number 5
4 small focus tube 2	filament circuit 1	focus number 3
5 large focus tube 3	filament circuit 2	focus number 8
6 small focus tube 3	filament circuit 1	focus number 6

After <TRANSMIT> a data screen comes up.
Important parameters are:

focus: see table above

Umin [kV]: minimum kV value, default 40kV from tube data file
modification with 'Tube Limits' possible
modified values appear after adaptation

Umax [kV]: maximum kV value, default 150kV from tube data file
modification with 'Tube Limits' possible
modified values appear after adaptation

Uiso [kV]: focus specific value, default value will be overridden after adaptation
(generator version = max emission current dependent)
Uiso is the kV value, from which on the filament current can be decreased to
drive always the max kV dependent emission current (with rising kV)

Pmax [W]: maximum focus output power, default focus dependent from tube data file
modified values after tube adaptation
(e.g.SRO33/**100** with Optimus 50: Pmax after adap =
50kW instead of 80kW)

IFmax [mA]: max filament current limit, default focus dependent from tube data file
modified values after tube adaptation
e.g. Pmax tube > Pmax generator

IFregelmax [mA]: = IFmax + analog offset value for regulation purposes,
typically IFmax + 200mA

FILcir: physical filament circuit on PCB FU_mA EZ119, see table above

I0 [uA]: I0 = max emission current at Umin (typically 40kV = default)
↑
I110 = e.g. max emission current at Umax (typically 150kV = default)
I120 [uA]: (I0 = **40kV**) + (I110 = **+110kV**) = **150 kV**
all values in between are (default) specified tube data coming from the
installation disc data file, values change when modified in the 'Tube

Limits'

screen and after adaptation

CU physical fil: CU can handle 9 filaments at max 3 tubes, see table above

- Faultfind

- **Read Actual Status**

Gives the actual status of the filament circuit. Several entries are possible in the three fields.

foc = see focus number FU-mA table page 29

static = condition of the filament like:
- FOCini no tube programmed
- normal tube programmed and adapted

dynamic = actual dynamic condition like:
- off no tube programmed
single focus tube, this circuit not in use
- standby in standby without error
- ctrl Xray during exposure or fluoro

- **Read Status Trace**

Displays the last 10 activities with FU_mA. All fields have several entries possible ...

to be continued

time relative time [ms] of the last 10 status changes

foc = see focus number FU-mA table page 29

old sta old static condition before status change

old dyn. old dynamic condition before status change

signal status change command

new sta new static condition after status change

new dyn. new dynamic condition after status change

- **Read Error**

- **Error: Info**

Displays an error code and sometimes the reason for the error entry.

class: Three error classes are possible:

- warning: Something happened being worth to be logged in the trace. Warnings are logged, but they are not displayed on the control desk and do not lead to a switch off of the exposure. If analog measurements e.g. increase the first limit, there will be an internal warning entry, which can be fixed during maintenance.
- error: An error always leads to an exposure off command. The error code will be displayed on control desk, which can be reset with the the labelled button or with any other.
- fatal: Fatal errors might be displayed on the control desk, but not in all cases. If there is a communication breakdown a fatal error might not be possible

the
reset

on

the CAN bus. As all error entries are logged in CU the information has to get to CU. None of the units has a memory to keep the fatal condition when the

fatal

generator has been turned off. So the information is lost. The only way to log it is by pushing the on button to warm reset the generator. Then the

error condition might be transmit to CU.

error code: The error code is a 4 digit code.
The first 2 digits represent the functional unit (see table in doc chapter FAULTFIND).
The last 2 digits give details of the error code, see details in chapter FAULTFIND.

error explanation: gives a brief explanation (not at all error entries of FU's)

task name: is the task name of the functional unit process during the error
ignore for troubleshooting

procedure name: is the procedure name of the FU process during the error
ignore for troubleshooting

previous warning: might give a previous message

previous explanation: might give a previous explanation

parameter: might be given if existent

- **Error: Actual Status**

Displays actual status during error: see 'Read Actual Status' page 30.

- **Error: Status Trace**

Displays status trace during error, only 3 entries: see 'Read Status Trace' page 30.

- **Error: HW Set Values**

If SW set (filament circuit 1) [mA]: filament current setpoint
filament circuit: see table page 29

If SW set (filament circuit 2) [mA]: filament current setpoint
filament circuit: see table page 29

FI ON (filament circuit 1) _____ : on = filament circuit 1 active (small focus)
- if all ready conditions present, activates triac V36 on EZ119 for intermediate DC circuit, but only in case of a two filament tube
off = filament circuit 1 inactive, e.g.
- during start up
- during adap of large focus
- error condition
- single focus tube (using large only)

FI ON (filament circuit 2) _____ : on = filament circuit 2 active (large focus)
- if all ready conditions present, activates triac V36 on EZ119 for intermediate DC circuit
off = filament circuit 1 inactive, e.g.
- during start up
- during adap of small focus
- error condition

EN STOP X _____ : on =
off =

EN X ACT : on =
off =

GRID control : on =
off =

GRID mode : on =
off =

- **Error: Read HW Values**

IF nominal (filament circuit 1) [mA]: filament current setpoint small focus
(see table page 29)

IF nominal (filament circuit 2) [mA]: filament current setpoint large focus
(see table page 29)

IF actual (filament circuit 1) [mA]: filament current actual value small focus
measuring point EZ119 X5 - (X8 gnd) 2.5A / V

IF actual (filament circuit 2) [mA]: filament current actual value large focus
measuring point EZ119 X7 - (X8 gnd) 2.5A / V

intermed circuit voltage (fil. cir. 1) [V]: intermediate DC supply of filament converter 1
small focus (typically 325V=)

intermed circuit voltage (fil. cir. 2) [V]: intermediate DC supply of filament converter 2
large focus (typically 325V=)

FU-mA version : hardware version of FU_mA

CAN identifier : address of unit on the CAN bus

CTRL X C : on / off = status of CTRL_X_C/ signal during event

X ACT S : on / off = status of X_ACT_S/ signal during event

- **Error: Specific Information**

to be continued

- **Functional Tests**

- **test watchdog**

to be continued

- **Monitoring**

- **read If nominal**

to be continued

- **read If actual**

to be continued

- **read intermed circuit voltage**

to be continued

- **read le measuring trace**

to be continued

- **read 8 bit port**

to be continued

- **read 16 bit port**

to be continued

- **read memory**

to be continued

- **Read le corrections**

to be continued

- **Adaptation Results**

- **Select Adaptation Table for Reading**

to be continued

- **Read Previously Selected Adaptation Table**

to be continued

- **Select Unit**

- **FU - kV**

- **Faultfind**

- **Power On Results**

- **Read Configuration**

to be continued

- **Logging Tables**

- **Read Trace**

to be continued

- **Read Error**

- **Error: Info**

to be continued

- **Error: Trace**

to be continued

- **Error: HW Set Values**

to be continued

- **Error: Read HW Values**

to be continued

- **Error: Specific Information**

to be continued

- **Functional Tests**

- **Test Watchdog**

to be continued

- **Test DAC - ADC**

Start function: execution <OK>

- **Test Converter**

to be continued see doc chapter FAULTFIND

- **Switch Error Handling**

to be continued

- **Monitoring**

- **Measure Temperatures**

to be continued

- **kV Measurements**

to be continued

- **Converter Measurements**

to be continued

- **Read 8 Bit Port**

to be continued

- **Read 16 bit Port**

to be continued

- **Read Memory**

to be continued